

## ABSTRACT

Title of dissertation: INVESTIGATION OF ELEMENTARY TEACHER  
CAPACITY TO IMPLEMENT ENVIRONMENTAL  
LITERACY REQUIREMENTS

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To uphold Maryland's environmental literacy high school graduation requirement and curricular standards, local school districts must develop programs that graduate environmentally literate students and provide effective teacher professional development. This study focused on assessing the confidence and ability of elementary teachers in a Maryland school district to implement these requirements. It also sought to determine if there is an association between teachers' environmental training and their own confidence teaching environmental literacy.

This study is a quantitative descriptive and exploratory study that utilized an online survey. Descriptive analysis and tests of significance were used to examine how teachers' experience, training and environmental knowledge relate to their awareness of state and district policy and curriculum, teaching about the environment, teaching outdoors, and overall confidence in teaching environmental concepts. The study found that elementary teachers in this school district have high awareness and confidence regarding teaching in and about the environment. They are also highly knowledgeable about environmental topics. These teachers demonstrated that focused training and experience significantly impacts confidence in environmental and outdoor teaching.

These findings provide compelling evidence of the need to incorporate direct experiences and practice when shaping environmental literacy teacher professional development.

Despite the overall confidence in teaching in and about the environment, a little over half of the teachers reported that they took students outside for instruction.

Challenges noted are similar to those reported in other studies and include safety, time, resources, appropriate spaces, permission, appropriateness, and student management.

Overcoming these challenges does not lie solely with teachers and their confidence but also will require input and support from the administration, facilities, and curriculum developers.

Focused professional development on the pedagogy and management strategies for instruction in the outdoors is needed for both teachers and administrators. The opportunity of utilizing school grounds as its own classroom needs to be pursued as a cultural and systemic shift in our understanding of the modern classroom. The integration of environmental topics and outdoor instruction into content areas beyond science will build both the understanding and capacity of teachers and benefit student engagement and environmental literacy.

INVESTIGATION OF ELEMENTARY TEACHER  
CAPACITY TO IMPLEMENT  
ENVIRONMENTAL LITERACY REQUIREMENTS

by

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## **Chapter I: Introduction**

### **Problem Statement**

With the adoption of a state mandated environmental literacy high school graduation requirement and learning standards, local school districts in Maryland must develop programs that graduate environmentally literate students and provide effective professional development for its teachers. Building on a strong foundation and history of environmental education and outdoor education in the state, the school districts' challenge is to have an effective curricula taught by teachers who are environmentally literate themselves. With no requirement for pre-service training in environmental literacy, and the knowledge that most teachers in general are not well-versed in this area, there is a need to better understand how to elevate the teachers to be more effective in teaching these concepts.

### **Purpose of the Study**

The purpose of this study was to investigate elementary teachers' reported confidence in their ability to teach environmental literacy standards and curriculum. Studies have shown that teachers' personal environmental literacy, along with their experiences, attitudes, and training in regards to the environment influence their confidence (Tuncer, et. al., [2009](#), Kahyaoglu, [2014](#), Atasoy, [2005](#), Shuman & Ham, 1997, and Kennelly, Taylor & Maxwell, [2008](#)). The focus of this study is on the teachers' personal environmental knowledge and their training in teaching about and in the environment and its influence on their confidence in their ability to teach in this area. By determining where teachers are regarding these concepts, professional development programs for in-service teachers can be developed and delivered to provide needed

environmental literacy instruction so that teachers can more successfully implement the environmental literacy requirements.

## **Rationale**

In April 2008 then Maryland Governor Martin O'Malley, "recognizing the urgency in ensuring that Maryland's young people have the opportunity to connect with nature and grow to become informed and responsible stewards of our environment," established, by Executive Order 01.01.2008.06, the Maryland Partnership for Children in Nature (Maryland Partnership for Children in Nature, 2009, [p 3](#)). This group worked to analyze different aspects of environmental literacy and made recommendations to the governor which included providing opportunities for increased environmental awareness through outdoor experiences and emphasized the importance of environmental education in formal education through suggesting the policy of an environmental literacy high school graduation requirement. This impetus stemmed from a movement inspired by Richard Louv through his popular book, *Last Child in the Woods: Saving Our Children from Nature Deficit Disorder* (Louv, [2009](#)). The book outlined the need to have children reconnect with nature and unplug from technology. Louv theorized that the lack of student involvement with the outdoors influences childhood conditions such as ADHD, obesity, and a lack of concern for the environment.

Recognizing this concern for Maryland youth and the continued concern for the health of the Chesapeake Bay, connecting students back to the environment to build environmental awareness and stewardship became a driver to change policy. Through the work of the Maryland Partnership for Children in Nature, environmental literate students were defined as:

students that possess the knowledge, intellectual skills, attitudes, experiences and motivation to make and act upon responsible environmental decisions as individuals and as members of their community. Environmentally literate students understand environmental and physical processes and systems, including human systems. They are able to analyze global, social, cultural, political, physical, economic and environmental relationships, and weigh various sides of environmental issues to make responsible decisions as individuals and as members of their community and citizens of the world (Maryland Partnership for Children in Nature, [2009, p4](#)).

In 2010, the Maryland State Department of Education (MSDE) implemented an environmental literacy high school graduation requirement which states: “All students must complete a locally designed high school program of environmental literacy as set forth in COMAR 13A.04.17 that is approved by the State Superintendent of Schools (Code of Maryland Regulations (COMAR) [13A.03.02.04](#)),” becoming the first state in the nation to implement such a policy.

This requirement is grounded in part on the recognized relationship of early experiences with nature and adult pro-environmental behavior and attitudes. Wells & Lekies ([2006](#)) conducted a study of 2000 adults aged 18-90 living in urban areas throughout the United States. Individuals were interviewed about their childhood experiences and current environmentalism as evidenced by their perceptions and statements about the environment. They found that interactions with natural environments during childhood play a significant role in shaping both environmental attitudes and behaviors in adulthood. This research along with other works on early environment exposure (Ewert,

Place & Sibthorp, [2005](#), Kellert, [2002](#)) influenced how practitioners, educators and researchers thought about how to cultivate and motivate positive adult behavior towards the environment.

Along with the high school graduation requirement, in 2011 MSDE passed Environmental Literacy Curriculum Standards Pre-K through 12 to be implemented by the local education agencies. The COMAR requires the school districts to develop a course of study to:

advance students' knowledge, confidence, skills, and motivation to make decisions and take actions that create and maintain an optimal relationship between themselves and the environment, and preserve and protect the unique natural resources of Maryland, particularly those of the Chesapeake Bay and its watershed. (COMAR [13A.04.17.01](#)).

The course of study strives to reach these goals of advancing student environmental literacy through the integration of the environmental curricular standards with other content standards such as science and social studies. The Maryland Environmental Literacy standards consist of 8 main standards (Figure 1). The primary focus is on the methodology of environmental issue investigation that engages students in researching and understanding local environmental issues and then engages students to take action to help to mitigate or resolve the issue. Standards focus on the science topics of understanding the earth systems, matter and energy flows, populations and ecosystem dynamics, and the social studies topics of societal health and the impact of humans on the environment (MSDE 2007).

## **MARYLAND ENVIRONMENTAL LITERACY STANDARDS**

### STANDARD 1 ENVIRONMENTAL ISSUES

The student will investigate and analyze environmental issues ranging from local to global perspectives and develop and implement a local action project that protects, sustains, or enhances the natural environment.

### STANDARD 2 INTERACTIONS OF EARTH'S SYSTEMS

The student will analyze and apply the properties of systems thinking and modeling to the study of Earth's systems.

### STANDARD 3 FLOW OF MATTER AND ENERGY

The student will analyze and explain the movement of matter and energy through interactions of earth's systems (*biosphere, geosphere, hydrosphere, atmosphere, and cryosphere*) and the influence of this movement on weather patterns, climatic zones, and the distribution of life.

### STANDARD 4 POPULATIONS, COMMUNITIES AND ECOSYSTEMS

The student will use physical, chemical, biological, and ecological concepts to analyze and explain the interdependence of humans and organisms in populations, communities and ecosystems.

### STANDARD 5 HUMANS AND NATURAL RESOURCES

The student will use concepts from chemistry, physics, biology, and ecology to analyze and interpret both positive and negative impacts of human activities on earth's natural systems and resources.

### STANDARD 6 ENVIRONMENT AND HEALTH

The student will use concepts from science, social studies and health to analyze and interpret both positive and negative impacts of natural events and human activities on human health.

### STANDARD 7 ENVIRONMENT & SOCIETY

The student will analyze how the interactions of heredity, experience, learning and culture influence social decisions and social change.

### STANDARD 8 SUSTAINABILITY

The student will make decisions that demonstrate understanding of natural communities and the ecological, economic, political, and social systems of human communities, and examine how their personal and collective actions affect the sustainability of these interrelated systems.

Figure 1: Maryland State Environmental Literacy Standards

As a result of the MSDE regulations, each school district was required to develop its own educational program incorporating the state environmental literacy standards based on their specific resources and needs of the educational community. There was little guidance or resources made available to school districts from the state to meet these

new requirements. As noted above, Maryland was the first state to implement an environmental literacy requirement, and there was only one individual in MSDE working on environmental education matters at that time. As a result, each of the 24 school districts developed their own strategies for implementation. Some school districts place a significant value on a single high school course, others have specified multiple environmental education experiences at different grade levels, and others are infusing the standards at every grade level. With this diversity in programs, there is no consistency in how the standards are implemented across the state, and to date there is no mechanism for determining if these different implementation strategies are successful in advancing environmental literacy.

Another part of the requirement involves the support of professional development sessions to train teachers in local environmental issues and methodology. Specifically, “Each local school system shall establish a support system to enable teachers and administrators to engage in high-quality professional development in content and knowledge, instructional materials, and methodology related to environmental education (COMAR, [13A.04.17.01](#)).” Professional development is vital in supporting the implementation of the standards and the goal of building an environmentally literate citizenry in Maryland. In order for professional development strategies and programs to be developed, and to be successful, it is imperative that we first determine the capabilities of teachers in regard to their understanding of and ability to teach environmental topics that will fulfill the state requirements.

## **History & Development of Environmental Policy in Maryland and District**

Environmental literacy and environmental education may seem like a new concept for public schools, but policies at the federal and state levels indicate otherwise. In 1970, Richard Nixon signed into law the first National Environmental Education Act ([P.L. 91-516](#)) to “establish education programs to encourage understanding of policies, and support of activities, designed to enhance environmental quality and maintain ecological balance.” This law established the Office of Environmental Education within the Office of Education and provided funding for environmental education activities such as curriculum development, professional development for preservice and in-service teachers, and outdoor programming. Funding and the office were eventually eliminated in 1981 but were reestablished with the passage of the National Environmental Education Act of 1990 (P. L. 101-619). Federal money was once again designated to help support curriculum and professional development but this time under the U.S. Environmental Protection Agency (EPA). Funding was made available for grants to support environmental education and training, and the development of curricula and resources. This Act is still in place today supporting environmental education efforts through the EPA with various funding amounts appropriated over the years. Though bills have been introduced in 2007 and 2010 to reauthorize the National Environmental Education Act of 1990 they were not successful (Bearden, 2008).

The recent passage of the Every Student Succeeds Act in 2015 supports environmental education as a provision of Title IV, Student Support and Academic Enrichment Grants, which authorizes funds to be designated for providing students with a “well-rounded” education including environmental education, history, civics, language,



and STEM, among others (S.1177). This is the first time that environmental education is spelled out within a federal education policy and not part of a separate entity. This illustrates that environmental education importance is moving more into the realm of being part of the regular curricular offerings in public education. This creates the opportunity for environmental education to be supported within the realm of formal education and provides funding to support environmental education activities (Figure 2).

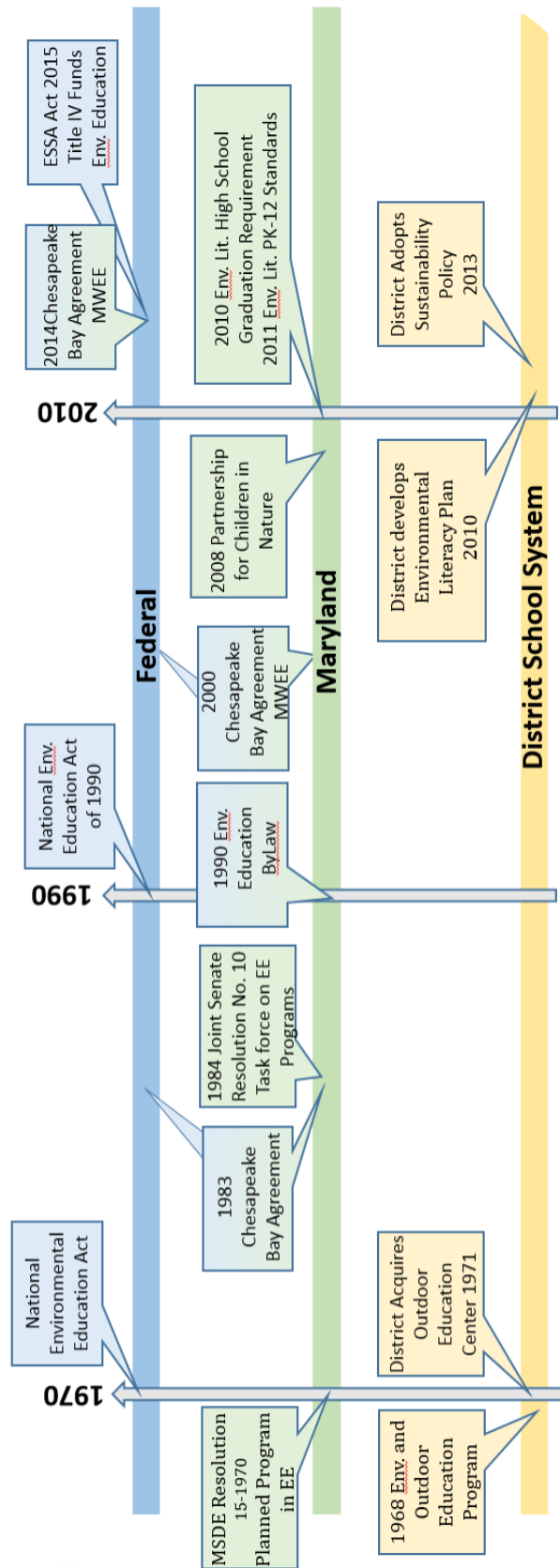


Figure 2: Timeline of environmental education at the federal, state, and local levels.

Maryland began its formal journey in environmental education in 1970 when MSDE passed resolution 1970-15 that encouraged the institution of a planned program of environmental education in all Maryland elementary and secondary schools. Interesting recommendations from the appointed committee at the time included environmental curricular development and implementation, requiring every school site contain an environmental study area, and establishing regional environmental education centers (Governor's Commission on Environmental Education, 1972). A joint resolution signed in 1984 called on the Maryland State Department of Education to "design and implement an environmental education program for all public school students from kindergarten through grade 12 (Senate Joint Resolution No. 10, 1984). It is not known what the results of these recommendations and resolutions were, or if any substantial action was taken towards implementing environmental education in the state. Maryland passed its first environmental education bylaw in 1990 requiring school systems to provide environmental education at least once in the elementary, middle, and high school years. It outlined goals and sub-goals that contained general areas related to the environment and individual responsibility, but these were not substantial and there were not standards clearly defined, nor were there accountable requirements for the districts. In 2010, when Maryland became the first state in the nation to pass an environmental literacy high school graduation requirement, environmental education was formalized as a necessary part of the Maryland educational experience.

In addition to the COMAR requirements, Maryland is a signatory on the Chesapeake Bay Watershed Agreement which also requires environmental education and literacy. The agreement is a product of the Chesapeake Bay Program partnership

originally formed in 1983 that brings together seven state jurisdictions, the Chesapeake Bay Commission, and the federal government to restore and protect the Chesapeake Bay. Reaffirmed in 2000 and then in 2014, the agreement includes the Environmental Literacy goal to “enable every student in the region to graduate with the knowledge and skills to act responsibly to protect and restore their local watershed (Chesapeake Bay Program, [2014 p.13](#)).” The requirements for each school district include: a) at least one meaningful watershed educational experience in elementary, middle, and high school depending on available resources, b) increase the number of sustainable schools that have student-led protection and restoration projects, and c) develop a comprehensive and systemic approach to environmental literacy for all students in the region that includes policies, practices, and voluntary metrics that support the environmental literacy Goals and Outcomes (Chesapeake Bay Program, [2014](#)). This regional agreement complements the 2010 Maryland environmental literacy policy by focusing on local outdoor field experiences as part of an overall environmental issue investigation.

Within the various Maryland county public school districts, environmental education has been an informal part of the curriculum since the late 1960s, shortly before the first Earth Day in 1970. Since then, field trips to nature centers, use of the school grounds for teaching, and other environmental teaching opportunities have been part of the educational experience. County school districts across the state were acquiring property and establishing environmental education centers. In 1968, this school district joined a number of other school districts by acquiring use of property to be used for providing environmental and outdoor education opportunities. The school district rented and then purchased property that helped to create a more formal opportunity for outdoor

experiences for students in the school district. Early on, this 24-acre property was largely utilized as space for recreation and environmental education, eventually becoming the central location for environmental education, environmental professional development and programming in the district.

The district's current Environmental Literacy and Outdoor Education program includes a designated curriculum coordinator, integrates environmental literacy curriculum pk-12, conducts professional development, and provides environmental programming through field experiences for over 25,000 students each year. The school district also adopted a Sustainability Plan ([2013](#)) that "directs the Superintendent to implement a curriculum that explores the relationship of sustainability principles to the environment and the economy, and encourages students, staff, and users to be responsible stewards of the environment (Board of Education, [2013 p1](#))."

These policies, from the federal to the local, set the stage for enhancing environmental education and the development of environmentally literate students. At the district level, this means the development of environmental literacy plans by stakeholders and partners and a cultural shift to supporting this goal through various strategies that have yet to be identified. For school facility designers, this will require that they now view the school yard as a classroom. For administrators, it will require an understanding of the value of environmental and outdoor instruction. And for teachers, these policies will require acquiring ecological and societal knowledge of local and global environmental issues and resources as well as the skills, methodology, and pedagogy of environmental and outdoor instruction.

## **Implementing Environmental Literacy in Schools**

Implementation of district-wide programs can be a challenging process that requires systematic buy-in and ongoing support that sustains the program (Adelman & Taylor, [1997](#)). States across the nation have adopted environmental standards but information or research on the successes or failures of state implemented environmental standards in school districts could not be found. States such as Wisconsin adopted state environmental education standards and California approved environmental education curriculum but both are voluntary and not mandatory (Fortier, J., Grady, S., Lee, S. & Marinac, P., [1998](#), A Blueprint for Environmental Literacy, [2015](#)). District implementation without a mandatory requirement weakens the fidelity of the implementation.

A review of the literature on the implementation of general district initiatives provides some insights into how those strategies could be applied to environmental literacy initiatives. Procedures for district-wide initiatives for curriculum implementation have been framed and tested by research focused on these basic elements: building a network of stakeholders and partners, envisioning success, developing mission and vision, setting goals, determining the size of the program, setting policies, developing curriculum, assessing the needs of educators, creating materials, and assessment and program evaluation (Adelman & Taylor, [1997](#); Lieberman, [2013](#); Jowers, Bradshaw, & Gately. [2007](#)). For the district that is the subject of this study, the implementation of a new vision for environmental literacy is still a work in progress, integrating both the new policy requirements and a long tradition of environmental and outdoor programming.

## **Curriculum**

The study's school district implementation of the environmental literacy requirements continues to adjust and change based on the current curricular initiatives occurring within the county. As new curriculum is being developed, environmental literacy standards and activities are incorporated into the core curriculum. This has created both an opportunity for the integration of interdisciplinary perspectives and the realization that there is a need for professional development in environmental issues, methodology and strategies for curriculum integration. In some of the states that have environmental standards, it has been up to the individual teacher to integrate these concepts with their regular curriculum requirements (Pedretti & Nazir, [2014](#), Lane & Wilke, [1996](#), Smith-Sebasto & Smith, [1997](#)). This approach does not integrate environmental literacy systemically or systematically, making it difficult to understand teacher abilities to teach about the environment, the level of learning occurring, and the environmental literacy of all students.

In the school district, the environmental literacy standards have been integrated within the core curriculum, emphasizing an environmental literacy unit at each grade level, although mostly in science and social studies. These units focus on local and global environmental issues that align well with standards being taught in the core science and social studies curriculum. The environmental literacy standards were incorporated into the curriculum with special focus on environmental issue investigations and include the goal of taking action. In some grades, interdisciplinary units/projects were developed to focus on an environmental issue such as habitat loss for example. Depending on the grade level, an entire project, unit, or quarter is completely focused on

the environment. For two of the elementary grade levels, an outdoor environmental literacy experience at the outdoor education facility is incorporated as part of the environmental literacy unit. These programs are provided by the Environmental Literacy and Outdoor Education office of the district and include day programs as well as residential programs.

State assessments in the core content areas are a focal point for many school administrators. Some research has shown that scores on state assessments actually improve when supported with environmental education experiences. Both Eick ([2012](#)) and Clavijo ([2002](#)) showed that the use of an outdoor classroom and environmental education did not affect performance of students in high-stakes exams in reading, language arts, or science while still adhering to the science curriculum standards. These studies did indicate that there are no negative implications of environmental literacy implementation. A study by Lieberman & Hoody (1998) investigated the use of the environment as an integrated context for learning (e.g. the EIC<sup>TM</sup> program) and reported increased performance on standardized measures of academic achievement in reading, writing, math, science, and social studies. This study reviewed 40 school programs that utilized the Environment as an Integrated Context for Learning Model that incorporated interdisciplinary learning, focused on hands-on activities that were mostly problem/project based, employed team teaching, differentiated instruction and emphasized the knowledge, understanding and appreciation for the local environment. Their study is highly regarded in the environmental education community because of the well establishment of the program within the schools surveyed, its rigor, and the direct ties it shows of increased achievement reading, writing, math, science and social studies.



## **Teacher Capacity**

Most teachers have not received any environmental education training as part of their pre-service experience. MkKeown-Ice, in a [2000](#) study of pre-service teacher education programs in all 50 states, reported that environmental education is generally not an institutionalized component of teacher training. As a result teachers are not able to effectively teach about the environment. A survey of higher education teacher preparation programs by Heimlich, et.al ([2004](#)) reached similar findings, and noted that in those instances where environmental education was included, the courses were methods courses, not content courses.

The political arena and policy in the individual states drives much of what is included in the curricula for teacher preparation. The pre-service student teacher experience does not include sustainability concepts as a component of the coursework requirements. One aspect that may impact the pre-service instruction in environmental education is a lack of expertise in environmental education among faculty at these institutions. Remarkably, even in the science education fields many of the student-teachers had a more in-depth understanding of environmental issues than their mentors (Heimlich, et.al [2004](#), Summers, Childs, & Corney, [2005](#)).

Wisconsin's teachers were assessed in environmental education seven years after a mandate was implemented requiring pre-service teachers to receive environmental education instruction. The study surveyed attitudes toward environmental concerns, the amount of class time devoted to teaching about the environment, and compliance with Wisconsin's Environmental Education mandates. The study revealed that despite the requirement for pre-service environmental education instruction, more than half of the

teachers had not received it, suggesting that many of the teaching institutions were not implementing the mandate. Those that had received pre-service training reported higher competencies, positive attitudes and class time associated with environmental education (Lane & Wilke, [1996](#))

In all these studies, environmental education or environmental literacy was not a state mandated high school graduation requirement. Environmental literacy standards, environmental issues, and methodology have been brought into the classroom by the initiatives of individual teachers and their desire to incorporate environmental concepts as part of their instruction. Though Maryland has set the stage for a different level of environmental knowledge by adopting a high school graduation requirement, at this time, there is no pre-service requirement for environmental literacy in Maryland.

Implementation of the environmental literacy requirements, as with all curricula, relies on the ability of the teacher to understand and implement the curriculum. Specifically, to be effective in building environmental literacy in their students, teachers need to be environmentally literate themselves. “If teachers do not have environmental knowledge, favorable environmental attitudes, and concerns about environmental problems, it is unlikely that their eventual students will, themselves, be environmentally literate (Tuncer, et. al., [2009 p435](#)).”

Schmitt ([2005](#)) interviewed teachers to determine their perceptions of the value of outdoor experiences for their students who had attended a residential environmental education facility. His focus group research revealed that the teachers felt the experiences positively affected the teaching and learning, provided authenticity, enhanced their curriculum, created opportunities to develop different thinking skills, and provided

experiences that students would not have had otherwise. Rickinson, et. al. ([2004](#))’s review of evidence-based research outlined a number of challenges for outdoor learning among which included health and safety concerns, teacher lack of confidence in teaching outdoors, curriculum requirements, and time. The teacher’s ability to understand environmental issues, concepts, and teaching methodology as well as the teacher’s perception of the value of such understanding becomes a key element in implementation. Atasoy ([2005](#)), cited in Kahyaoglu ([2014](#)), reported that in order to have a successful environmental education curriculum, teachers need to have background information in the environment, environmental sensitivity, and the ability to successfully conduct environmental activities and studies.

However, several studies assessed that the environmental literacy of pre-service teachers and found that the majority had low levels of environmental knowledge and environmental literacy but expressed positive attitudes and high levels of concern for the environment ([Al-Dajeh, 2012](#), Esa, N., [2010](#), Tuncer, et.al, [2009](#)).

Goldman, Yavetz and Pe’er ([2014](#)) examined the development of pre-service teachers’ environmental literacy and how it may have been influenced by their undergraduate teacher program. Using a longitudinal study, the pre-service teachers were questioned in a pre/post-test design to determine if their environmental literacy varied based on their program of study. The authors found that whether those pre-service teachers were in a science/environment field or in a non-science field, they all had a basic comprehension of environmental issues. Furthermore, those majoring in the sciences did not indicate a higher commitment to personal environmental behaviors such as recycling and citizenship action than those in other pre-service teacher majors. All of the pre-

service teachers interviewed had environmentally supportive attitudes, this included questions on the value of the natural environment, priorities for environmental policy and the importance of environmental education in the educational system. Smith-Sabasto and Smith ([1997](#)) surveyed both Wisconsin and Illinois teachers on their current practices regarding environmental education as part of their teaching. They examined the teacher's preparation for the infusion of environmental concepts into their teaching and their attitude toward environmental education. Their study suggested that in general teachers are positive toward environmental education but do not teach it. Reasons listed by teachers for not teaching environmental concepts included not enough resources or funding, not enough preparation time, not enough knowledge and background, and not enough relation to the subject taught. A number of other studies reported a variety of similar challenges listed by teachers that made it difficult to implement environmental and sustainability concepts. Teachers mentioned an overcrowded curriculum, a lack of resources, a lack of class time, difficulty aligning with official expectations, not enough preparation time, not enough resources, limited professional knowledge about outdoor education and general lack of experience (Forbes & Zint, [2011](#), Smith-Sabasto & Smith, [1997](#), Pedretti & Nazir, [2014](#)).

Pedretti and Nazir ([2014](#)) set out to gain a better understanding of teachers' views of environmental education in Ontario, Canada, where environmental education has been mandated to be included in school curricula since 2009. Their study revealed that environmental knowledge came from personal experiences rather than professional sources. Shuman & Ham ([1997](#)) and Kennelly, Taylor & Maxwell ([2008](#)) also found that teachers' life experiences may also influence their commitment to teaching

environmental issues and education. These experiences included spending a lot of time in the outdoors as a child, or a taking college course that incorporated outdoor field experiences. A teachers' own beliefs often influence their pedagogical content knowledge, classroom practices, and how they organize their teaching (Magnusson, Kracjik, & Borko, [1999](#), Richardson, [1994](#)).

One consideration that raises potential concerns is when an environmental issue has proven controversial in terms of social, economic, and/or political factors (e.g., climate change, or game hunting) (Muth, Polizzi & Glynn, [2007](#)). Teachers may feel uncomfortable in addressing these issues in the classroom for fear of backlash from parents. Research shows that most teachers are not well trained in leading discussions about controversial issues, nor do they have the abilities or skills necessary to negotiate conflicting opinions in the classroom (Wienberger & Dreyfus, [2013](#)). Understanding the difference between environmental education and literacy (teaching how to think about environmental issues) and environmental advocacy (teaching what to think about environmental issues) (Jickling, [2003](#)) is an important aspect of environmental literacy. This distinction is of critical importance for teachers thinking about how to implement environmental education insights and perspectives into their curriculum. Professional development programs could make a major contribution toward assisting teachers in negotiating these challenges.

### **The Capacity of the School District Teachers**

The school district which serves as the site of the proposed study employs almost 5,800 teachers. With the implementation of environmental literacy curriculum pre-kindergarten through 12<sup>th</sup> grade, it is important that teachers are environmentally literate

themselves (Tuncer, et.al, [2009](#)) in order to effectively instruct and provide environmental education experiences for the district's 81,000 students. The interdisciplinary aspect of environmental instruction allows environmental concepts to be explored across subject areas but recent professional development focused on environmental literacy is limited in its scope, and attendance of professional development sessions by in-service teachers is minimal (<5% of district teachers per year) (Parker, [2016](#)). Professional development for teachers generally provides support for new curriculum, mostly science, and has limited reach. There are very few studies that assess teachers to determine their ability and confidence to teach environmental literacy (Smith-Sebasto & Smith, [1997](#), Pedretti & Nazir, [2014](#)).

Studies have shown that teacher environmental knowledge and literacy, training, personal beliefs and attitudes towards the environment, and life experiences are all factors that may influence the teacher confidence, desire, and ability to incorporate environmental concepts and use the environment as a classroom (Tuncer, et. al., [2009](#), Kahyaoglu, [2014](#), Atasoy, [2005](#), Shuman & Ham, 1997, and Kennelly, Taylor & Maxwell, [2008](#)) (Figure 3).

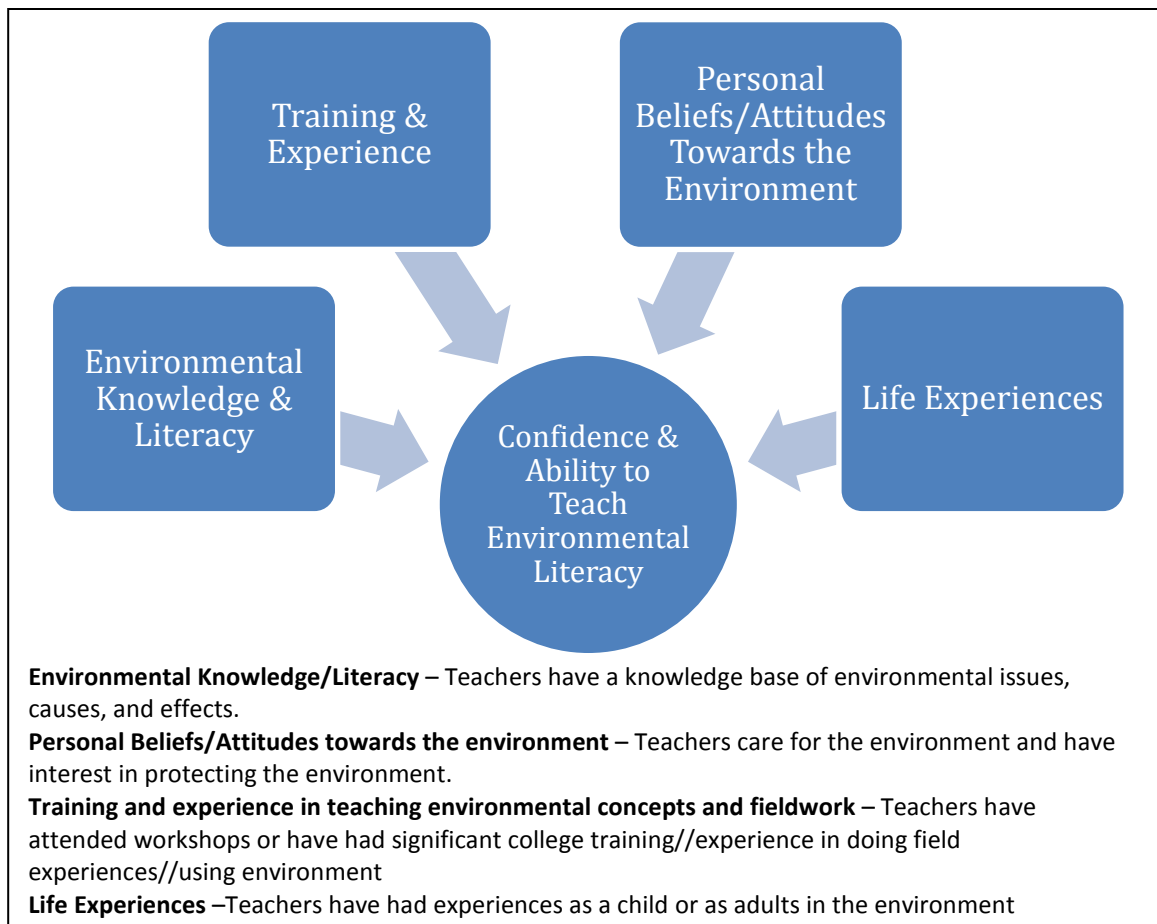


Figure 3: Factors that Influence Teacher Confidence and Ability

Therefore, this study proposes to focus on two aspects of these influences: environmental knowledge and literacy, and the teacher's training and experience. Though the author recognizes the influences of life experiences and personal beliefs and attitudes, these are elements that cannot be altered or influenced through teacher professional development. The study focuses on assessing the confidence and ability of elementary teachers in a Maryland School District to teach environmental literacy and determining if there are relationships with their experience and training in environmental education methodology and their own environmental literacy. The study will determine the capabilities of teachers to implement environmental education into the curriculum, and in so doing will also identify where the needs are greatest in ensuring the success of these

efforts to meet the new environmental literacy requirements. The results of this research will provide the basis for constructing a professional development plan that will facilitate the school district's ability to fulfill the state's environmental literacy requirements.



## **Chapter II: Methods**

### **Research Questions**

The purpose of this study is to assess the confidence and ability of elementary teachers in a Maryland School District to teach environmental literacy and to determine if there are relationships with their experience and training in environmental education methodology and their own environmental literacy. The following research questions help guide this study.

1. What are the teachers' perceived level of self-confidence in teaching environmental concepts?
2. What training and experience do teachers report having in environmental issues and methodology in using the outdoors as a classroom?
3. What is the environmental knowledge and literacy of elementary teachers in this school district?
4. Is there a relationship between the teacher's awareness and self-confidence and their own environmental literacy and training and experiences?

### **Study Design**

This study is a quantitative descriptive and exploratory study utilizing a survey design. Information was gathered from elementary in-service teachers in the school district through a web-based online survey. The study was approved by the University of Maryland Institutional Review Board (IRB) (Appendix A) and by the Research Office of the District Instructional Data Division (Appendix B). Analysis was conducted through descriptive analysis and tests of significance.

## **Data Collection Instrument**

A questionnaire survey was developed to gather information from the participants. As a first step survey questions were developed using information gathered from previous research and identified needs of the research questions. The survey was piloted with ten elementary teachers to gather response time, online errors, and to identify confusing questions. Based on the results of the field test, the survey was revised to correct any issues that arose, as well as to improve the overall effectiveness of the questionnaire.

The final questionnaire consisted of 38 questions divided into several category sections: consent to participate form (1 question), demographic information (3 questions), training (2 questions), teachers' awareness (4 questions), teach about the environment (3 questions), teach in the outdoors (6 questions) and self-confidence (7 questions), and environmental knowledge test (12 questions) (Appendix C).

The first section of the survey includes the consent form with information regarding confidentiality, risks, benefits, and contact information. The second section focuses on demographic information including the grade level the respondent teaches, content area(s) they teach, and the number of years they had been teaching.

The next sections contain questions to gain information for each of the research questions:

***What training and experience do teachers report having in environmental issues and methodology in using the outdoors as a classroom?***

The selection of possible professional development opportunities were determined by examining the current offerings of environmental literacy professional development

within the district, college course offerings as well as workshops within the environmental community, and previous research (Pedretti & Nazir, [2014](#)).

- Have you participated in any professional development related to teaching environmental topics or teaching outdoors? Participants indicate the number of courses/workshops of six types of workshops that include district environmental literacy training, curriculum in-services that incorporated environmental topics, college courses, continuing education courses, and other non-profit workshops or conferences.
- Teachers are then asked to rank the effectiveness of the different types of professional development they have received.

***What is the teachers' perceived level of awareness and self-confidence in teaching environmental concepts?***

Four question sections focus on different areas of inquiry: Awareness, Teach About the Environment, Teach Outdoors, and Confidence. Questions were based on current knowledge of district environmental literacy activities and related research on teacher efficacy and practice (Pedretti & Nazir, [2014](#), Smith-Sebasto & Smith, 1997, Riggs & Enochs, [1990](#)).

- Awareness: Teachers were asked to indicate their knowledge of the environmental literacy standards and curriculum by indicating on a scale of 'very aware', 'had heard about it', and 'did not know'.
- Teach Environment: To understand current involvement with teaching and the environment, teachers were asked: "When you teach how often do you... take students outside as part of instruction, teach about environmental issues, use the

environment as a theme?” The teachers are asked to indicate on a 4-point Likert scale of ‘often’ to ‘never’.

- Teach Outdoors: This section of questions focuses on their agreement with a number of statements related to taking students outdoors for instruction. Using a 5-point Likert scale, teachers were given 6 items, with statements such as ‘Managing students outside is very hard’ and ‘I feel my students learn better when using the outdoors to teach’ for which they indicated ‘Strongly Agree’ to ‘Strongly Disagree.’
- Confidence: To determine confidence in incorporating or teaching environmental issues to their students, teachers were asked to indicate their agreement to 7 statements including ‘I can easily answer student questions about the environment’ and ‘I know many resources I can utilize to help me teach about the environment.’

***What is the environmental knowledge and literacy of elementary teachers in this school district?***

- Environmental literacy of the teachers was assessed using survey questions based on the National Environmental Education and Training Foundation & Roper Starch Worldwide ([1997, 2001](#)) survey of Americans on their environmental knowledge (Coyle, [2005](#)), (Tuncer et al. [2009](#)); (Kaplowitz & Levine, [2005](#)) as well as questions from other related research (Vlaardingerbroek, & Taylor ([2007](#))). These 12 multiple choice questions assessed the basic knowledge literacy of teachers regarding the environment.

## **Study Population**

Elementary teachers currently teaching pre-kindergarten through fifth grade in the school district (in-service teachers) were solicited to participate in this research. These teachers were selected for the study because the school district has developed environmental literacy units in each of the grade levels. These units are infused with core content curriculum primarily in science and social studies. There is also an emphasis by the district to teach environmental literacy concepts and to use the environment as a context for teaching and learning regardless of the content area. These imbedded environmental literacy units with emphasis on the use of the outdoors and the incorporation of environmental projects in the curriculum impact almost all elementary teachers.

The entire population of elementary teachers in the district received an invitation to participate in the study. All teachers that currently teach a specific grade level as well as those teachers that teach multiple grades, like music, art, and special education teachers, were sent invitations. Because of the interdisciplinary nature of the environmental literacy, all teachers were incorporated as part of the study to gain an understanding across all content areas of their confidence to teach about the environment (Table 1).

Table 1

*Number of Teachers at Each Grade Level*

Grade	Number of Teachers
Pre Kindergarten	62
Kindergarten	301
1	280
2	293
3	284
4	255
5	245
All Grade (i.e. Special Education, Art, Music)	949
Total	2669

**Data Collection Procedures**

Email addresses of all current elementary school teachers in the district were obtained through the school district research office for the purpose of this research project. The teachers were sent a total of three emails that described the study and requested their participation (Appendix D). For this study, all 2017 elementary school teachers in the district were sent an email requesting participation in the study from the author. Embedded in the email was a link to the online web-based survey. Participants self-selected to participate in the study. Participation was completely anonymous and no personal information was collected. Two follow-up emails were sent to all potential participants, one each week following the original email to encourage participation. Data from the survey was then compiled and analysis was performed on information collected from the respondents.

**Plan for Analysis**

Questionnaire answers were viewed for incomplete or missing data and the respondents with incomplete data were removed. The response to the survey questions

were analyzed based on the type of question. Direct values will be used for the demographics and the Likert-type data were assigned a numeric value to determine averages. A score was applied to the environmental literacy test as a whole.

Demographic information was analyzed through measures of central tendency including mean, median, and mode as well as examining the deviation and range. This was applied to aggregate data to determine if demographic information has any implications for the study.

Analysis will be focused based on the research questions:

***What training and experience do teachers have in environmental issues and methodology in using the outdoors as a classroom?***

- The type of professional development was translated into hours. These hours are based on the average amount of time the specific course is generally offered. For example, environmental literacy training offered by the district is typically 3 hours in length whereas a college or a Maryland State Department of Education (MSDE) continuing education course is 45 hours of instruction (Table 2).

Table 2

*Professional Development Total Hour Calculations*

Type of Training	Number of courses x number of expected hours
District environmental literacy training	x 3
District content curriculum training that included environmental literacy as component	x 1
College course with environment/outdoor focus	x 45
MSDE Continuing Credit Course – District or other sponsor with environmental/outdoor focus	x 45
Other Workshop – non-credit (Project Learning Tree, Chesapeake Bay Foundation, nonprofit, DNR, etc.)	x 3
Other Environmental Professional Development (i.e. conference, online)	x 3

- The number of hours of training was recorded and grouped into 3 levels of training to be used to see if there was a relationship between the number of hours of professional development and the responses to the other questions.
- An analysis by grade level groups was conducted to determine if any grade levels were recognized as having more training.
- An analysis by intensity of training was also examined. The respondents were grouped in to 3 groups: intensive environmental literacy training – those respondents that took more than 6 hours of District Environmental Literacy Training and or MSDE Continuing Education Course, Other training – those that took any environmental literacy training, and those that indicated no training.
- The effectiveness of the professional development was averaged to determine the most and least effective methods.



***What is the teachers' perceived level of awareness & self-confidence in teaching environmental concepts?***

- Awareness: A numerical value (3-1) was assigned to the Likert scale of 'very aware,' 'had heard about it,' and 'did not know' on the questions of their awareness of the environmental literacy standards and curriculum. Descriptive analysis of the responses was applied to determine environmental curriculum awareness of the teachers.
- Teach About Environment: A numerical value (4-1) was assigned to the 4 point Likert scale of 'often,' 'sometimes,' 'rarely,' and 'never' on the questions of how often they take students outdoors, teach environmental issues, and use the environment as a theme. Descriptive analysis of the responses was applied to determine the level of teaching about the environment.
- Teach Outdoors: A numerical value (5-1) was assigned to the 5 point Likert scale 'strongly agree' to 'strongly disagree' for each of the statements related to taking students outdoors for instruction. Descriptive analysis of the responses was applied to analyze the level of teaching outdoors. For tests of significance, reverse scoring was utilized for the two negatively worded questions, 'Managing students outside is very hard,' and 'The administrator does not want us to take students outside for instruction.'
- Confidence: A numerical value (5-1) was assigned to the 5 point Likert scale 'strongly agree' to 'strongly disagree' for each of the statements of confidence in teaching environmental concepts. Descriptive statistics were used to examine the responses to each of the questions. For tests of significance reverse scoring was

utilized for the negatively worded questions, 'The environment does not apply to my content area(s) I teach,' 'I feel that teaching about the environment wastes time in the classroom' and 'I do not know anything about local environmental issues and problems.'

- Cronbach's alpha was used to determine if the groups of questions have internal consistency (Cronbach, 1951) to examine how closely related the items were in each group. This supports the validity of the questions as a measure for each area so that the numerical value for these would be translated to an interval scale and the groupings could be utilized in the tests of significance.

***What is the environmental knowledge and literacy of elementary teachers in this school district?***

- Scoring on the test was evaluated for general performance of the teachers for their environmental knowledge and compared to national scores.

***Is there a relationship between the teachers' self-confidence and awareness and their own environmental knowledge, training and experiences?***

- An Analysis of Variance (ANOVA) was conducted to examine if years teaching determines the teacher's environmental knowledge, training, and overall teacher confidence as measured by the Awareness, Teach Environment, Teach Outdoors, and Confidence scales. This test is to examine the hypothesis that the more experience a teacher has, the more confident the teacher will be in environmental topics and methodology.
- An Analysis of Variance (ANOVA) test was conducted to determine the significance of the professional development training and overall teacher

confidence measured by the Awareness, Teach About Environment, Teach Outdoors, and Confidence scales. The ANOVA was utilized to look at the hypothesis that the more training (number of hours) that occurs, the more confidence the teachers will have.

- An ANOVA also was used to examine if intensive environmental literacy professional development had an effect on overall teacher confidence.
- A t-test analysis looked at the training and confidence by grades that predominately participate in the curriculum-based outdoor environmental experience (grades K, 4) and the other grade levels (grades 1, 2, 3, 5) and to determine if training or experience at these particular grade levels had any effect on their confidence.

## Chapter III: Results & Conclusion

All 2669 elementary teachers were solicited to participate in the study with two follow-up emails for those that had not responded. Six of the email addresses were not valid and were eliminated from the total potential pool of participants. From 2663 potential participants, 638 survey responses were determined to be usable for the analysis, meeting a 95% confidence level with less than a 3.5 percent margin of error with a 24% usable return rate.

### Demographics

Participants were asked what grade they primarily taught. Table 3 below indicates the distribution of the grades taught by respondents. The highest number of respondents was from those that teach multiple grades. The second highest are Kindergarten and 4<sup>th</sup> grades. It should be noted that the district conducts outdoor programming at those grade levels. In examining the grade level response, there was a relatively even response return as a percentage of the district population for each of the grade levels, with pre-kindergarten have the highest percentage of teachers participating at 40%.

Table 3

#### *Distribution of Respondents*

Grade Level	Potential Participants	Responded	% of Respondents	% of District Population
Pre Kindergarten	62	25	4	40
Kindergarten	301	86	14	29
1	280	60	9	21
2	293	72	11	25
3	284	62	10	22
4	255	85	13	33
5	245	70	11	29
All Grades	949	178	28	19
Total		638	100	

Respondents were able to choose which content area they taught. Because elementary teachers tend not to be content specialists, they were able to indicate more than one content area. The majority of the responding elementary teachers (45%) teach all the core content areas: math, science, social studies, and language arts. An additional 27% of the respondents indicated that they taught in more than one content area. The distribution of content areas is indicated in Figure 4.

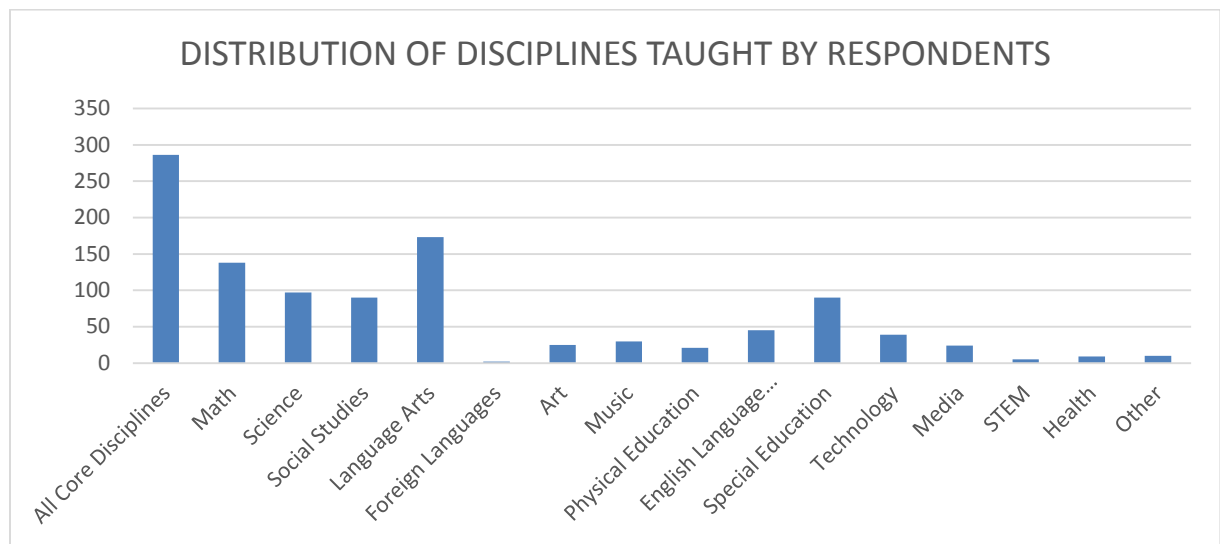


Figure 4: Distribution of Disciplines Taught by Respondents

The average number of years the respondents have been teaching is 13.9 years with a distribution of 1 to 43 years. The distribution indicates a broad response regarding experience. The respondents are on average experienced teachers. This broad distribution of experience allows for a less biased study by avoiding issues that may arise with having the majority of respondents as new teachers that have little experience or teachers who are at the end of their career. The median years teaching was 13 years and the mode was 3 years, standard deviation was 9. For the purpose of tests of significance analysis, the experience level was grouped along evenly distributed response categories: 1-9 years, 10-19 years, and 20+ years.

## Professional Development

The participants were asked if they had engaged in professional development training. Table 4 indicates the total number of estimated hours. Teachers indicated they attended 26,574 hours of professional development training in environmental literacy. However, what we do not know are the specifics of the training. We can surmise that the district and continuing education courses are much more focused on environmental literacy training, but the college courses may have been taken as part of their pre-teaching experience and could include general courses that have environmental components like biology. Thirty-two percent of the respondents indicated that they had not attended any environmental literacy professional development training. Of the respondents, 48% reported attending a district environmental literacy training course or session. For analysis reasons, the professional development was categorized along evenly distributed lines based on the total hours at 1-6 hours, 7-52 hours, and 53+ hours.

Table 4

### *Professional Development Training in Environmental Literacy*

Type of Training	Course x hours	Total Hours	% Of Respondents
District environmental literacy training	687 x 3	2061	48
District content curriculum training that included environmental literacy as component	481 x 1	471	37
College course with environment/outdoor focus	321 x 45	14445	25
MSDE Continuing Credit Course – District or other sponsor with environmental/outdoor focus	184 x 45	8280	17
Other Workshop – non-credit (Project Learning Tree, Chesapeake Bay Foundation, nonprofit, DNR, etc)	303 x 3	909	24
Other Environmental Professional Development (i.e. conference, online)	109 x 3	327	8
Total Hours		26574	
More than 1 training			46
Did not indicate any training			32

Distribution of environmental professional development by grade level is displayed in Figure 5. The professional development category of district environmental literacy indicated the highest number of respondents. Kindergarten and fourth grade teachers reported the highest attendance in that category. This may be related to the fact that kindergarten and fourth grade participate in direct outdoor programming, and specific professional development is offered to these teachers for that programming.

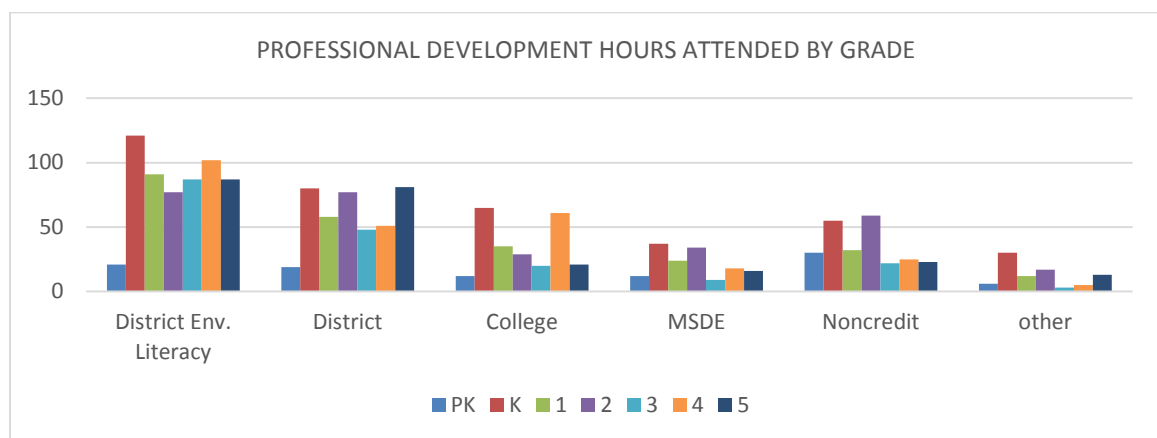


Figure 5: Professional Development Hours Attended by Grade

### Professional Development Effectiveness

Participants were asked to rank the types of professional development with 1 being the most effective and 6 being the least effective. Of the teachers that responded to the effectiveness question, the district environmental literacy professional development was ranked as the most effective with a mean of 1.93. The ‘other’ category was ranked as the least effective with a mean of 4.25. From the teacher’s perspective, targeted professional development, as indicated in this ranking, would have a more effective outcome for teacher professional development (Table 5).

Table 5

*Effectiveness of Professional Development Training*

Type of Training	n	Mean Response
District environmental literacy training	379	1.93
District content curriculum training that included environmental literacy as component	333	2.65
MSDE Continuing Credit Course – District or other sponsor with environmental/outdoor focus	256	2.95
Other Workshop – non-credit (Project Learning Tree, Chesapeake Bay Foundation, nonprofit, DNR, etc.)	287	3.14
College course with environment/outdoor focus	274	3.29
Other Environmental Professional Development (i.e. conference, online)	225	4.25

*Note:* Respondents were asked to rank the 6 categories with 1 being most effective and 6 being the least effective.

**Awareness and Self-Confidence Measures**

The awareness and self-confidence measures were grouped into four sets of questions: Awareness, Teaching About the Environment, Teaching in the Outdoors, and Confidence. The four sets of questions were tested for their internal reliability using Cronbach's Alpha. The calculations indicated a moderate degree of internal consistency (Table 6) (Nunnally, 1978). This internal consistency provides validity for utilizing the grouped questions as a single measure where the answers were averaged in each category to provide means for further analysis.

Table 6

*Reliability of Grouped Questions*

Question Series	Number of Questions	Cronbach's Alpha
Awareness	4	.74
Teach Environment	3	.71
Teach Outdoors	6	.64
Confidence	7	.76



## Awareness

Elementary teachers in the district indicated their knowledge of the state and district policy and curriculum. Table 7 displays the percentage of respondents indicating their awareness of environmental literacy policy and curriculum. There was high awareness of the local district environmental literacy curriculum and programs. Notwithstanding knowledge of local district curriculum and although the environmental literacy graduation requirement has been in place for 7 years, 53% the elementary teachers reported that they did not know about the requirement and 21% did not know about the state environmental literacy standards. This may indicate a lack of effectiveness in communication of these requirements from the district or state level. Given that most of the respondents were aware of environmental literacy curriculum integration and programming indicates the effectiveness of the district's efforts to integrate the environmental literacy standards into the regular curriculum.

Table 7

### *Responses to Awareness Questions*

<b>Are you aware that</b>	<b>Very Aware</b>	<b>Had heard about it</b>	<b>Did not know</b>
There are Maryland Environmental Literacy Standards (n=638) (missing n=4)	44% (n=278)	35% (n=223)	21% (n=133)
Maryland has a high school graduation requirement in environmental literacy (n=638) (missing n=6)	21% (n=136)	25% (n=162)	53% (n=334)
District has embedded environmental literacy focused units/activities in the curriculum at each grade (n=638) (missing n=8)	61% (n=389)	27% (n=171)	11% (n=70)
Kindergarten and Fourth Grade attend environmental literacy field experiences at Camp Woodlands and Arlington Echo (n=638)(missing n=5)	87% (n=553)	9% (n=57)	4% (n=23)

## Teach About Environment

“I think it helps them make connections to their own lives. Learning has more relevance that way.” -Teacher Comment.

Using the Likert scale, teachers were asked to indicate their agreement regarding teaching outside, teaching about environmental issues, and using the environment as a theme for instruction. More than half (56%) of the respondents reported taking students outside often or sometimes as part of instruction (Table 8). This is a much lower percentage in regard to the number of the respondents that reported teaching about environmental issues and/or using the environment as a theme (78% & 76%). Though teachers seem to indicate the use of the environment as an important content topic, the use of the outdoor environment is much less apparent. District-wide curricular integration of environmental topics and themes could contribute to the positive responses to these questions. It will be important to understand why teachers do not utilize the outdoor environment as part of their teaching as we develop professional development initiatives for environmental literacy as well as curricula that employ the outdoors as a classroom.

Table 8

### *Responses to Teaching About the Environment*

<b>When you teach, how often do you</b>	<b>Often</b>	<b>Sometimes</b>	<b>Rarely</b>	<b>Never</b>
Take students outside as part of instruction (n=638) (missing n=1)	9% (n=58)	47% (n=301)	35% (n=222)	9% (n=56)
Teach your students about environmental issues such as pollution, climate, habitat loss, Chesapeake Bay (n=638) (missing n=1)	31% (n=199)	47% (n=300)	17% (n=109)	5% (n=30)
Use the environment/nature as a theme, for example: writing poetry about the weather, drawing animals, measuring trees (n=638) (missing n=0)	29% (n=183)	47% (n=303)	20% (n=127)	4% (n=25)

## **Teaching in the Outdoors**

Responding to the series of questions on teacher confidence outdoors, teachers overall were positive about each of the statements, with the highest percentage (89%), knowing their school property (Table 9). These overall positive responses indicate a fairly high confidence by teachers in utilizing the outdoors for instruction. Comments from the teachers included: “I love the outdoors. Having more than one adult makes me more comfortable when taking children outside to learn,” and “Hands on opportunities are the best!” A few comments from the teachers indicated the misconception that environmental and outdoor teaching were only for science: “I do not teach science so I do not have the opportunity to instruct on science topics outside.”

For the statement, “I feel comfortable taking students outside for instruction,” 18% indicated they were undecided or did not agree with the statement. Twenty-seven percent of the respondents indicated that they agree with the statement that “managing students outside is very hard” with 13% reporting being undecided. Taking students outside does require management strategies different from those of the traditional classroom and this understanding of techniques and strategies, is reflected in those responses. This finding is consistent with the previous set of questions that asked if teachers actually took students outdoors for instruction (56%). These findings suggest the need to work with teachers to increase their comfort level and managing techniques for taking students outdoors.

Some additional challenges that teachers mentioned with regard to teaching outdoors include the following:

- “The challenge in learning outside is meeting all other curriculum requirements and managing.”
- “Due to some behavior problems in my class, I am limited to going outside without another adult.”
- “I love the idea of using nature to teach lessons, however, time restrictions have been a concern of mine.”
- “With our ‘bell to bell’ curriculum, there is NO time to go outdoors or even transition between lessons.”
- “The neighborhood surrounding my school is not very safe.”

These specific challenges were also found in other studies on environmental and outdoor education (Rickinson, et. al., [2004](#)).

When examining the other responses in this category, there were higher percentages in the undecided response to the statements “The administrator does not want us to take students outside for instruction” (20%) and “I feel my students learn better when using the outdoors to teach” (41%). The role of administrators in teachers’ ability to conduct instruction outdoors and to support this type of instruction were reflected in the teacher responses of 20% undecided and 6% that agree that the administrator does not want them to take students outdoors. Comments by teachers included:

- “Our administration does not tell us that we cannot go outside, but there is more scrutiny and follow up on our lessons when we do,”
- “[During my current teaching], outdoor learning has not been encouraged/discussed regarding safety which consequently [can cause] teacher inhibitions [for going outside],”

- “My administration doesn't even know what's out there. Nor do other teachers. Sad.”

These perspectives were mirrored in a study by Dymont (2005), which noted, “At some schools, teachers reported that they were not supported by their principal to use the outdoor classroom.”

It is common knowledge that administrative support is an important aspect in all facets of teaching. If administrators do not voice support for environmental/outdoor learning, are ambivalent, and/or question teachers about it, teachers will feel less inclined to utilize these resources. Without clear support from the administrator, many teachers may find themselves reluctant to take their students outdoors.

Table 9

*Responses to Teaching Outdoors*

<b>Please indicate your agreement with the following statements about taking students outdoors for instruction</b>	<b>Strongly Agree</b>	<b>Agree</b>	<b>Undecided</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
I feel comfortable taking students outside for instruction (n=638) (missing n=0)	39% (n=249)	43% (n=276)	11% (n=72)	5% (n=31)	2% (n=10)
Managing students outside is very hard (n=638) (missing n=4)	4% (n=24)	23% (n=638)	13% (n=638)	48% (n=306)	12% (n=78)
I know my school's outdoor property (n=638) (missing n=5)	44% (n=282)	44% (n=280)	5% (n=33)	5% (n=32)	1% (n=6)
The administrator does not want us to take students outside for instruction (n=638) (missing n=0)	1% (n=7)	5% (n=31)	20% (n=129)	41% (n=261)	33% (n=210)
Unpredictable things that happen outside are opportunities for students to learn (n=638) (missing n=1)	25% (n=157)	58% (n=368)	13% (n=82)	3% (n=21)	1% (n=9)
I feel my students learn better when using the outdoors to teach (n=638) (missing n=1)	12% (n=79)	42% (n=12)	41% (n=266)	3% (n=22)	1% (n=6)

## Confidence

Teachers responded to a series of questions that explored their confidence regarding environmental teaching. In an effort to have teachers think carefully about their responses, some of the questions were posed in a positive fashion and some were worded negatively. It was important in this category to examine the degree to which teachers were confident in their own teaching as well as their attitude toward environmental teaching. Teachers indicated a strong positive agreement with many of the statements (Table 10). Eighty-six percent reported that they agree that environmental issues apply to the content areas they teach. This is an important finding for environmental literacy integration in that it indicates it is seen by teachers as a multidisciplinary topic, and thus one that would have relevance for all subject areas. This knowledge helps to embrace an important tenant of the environmental literacy policy in that the standards are to be infused within the regular curriculum. Acceptance of teachers to see the relevance of environmental topics in their subject areas is important for this integration. Regarding student knowledge of environmental issues, 30% of teachers were undecided, while 24% disagreed that students were knowledgeable about these issues. Thirty-three percent of teachers were undecided about whether students learn better using the environment. These findings are interesting because while teachers reported they were confident about their knowledge about the environment (82%), they were less confident regarding student knowledge about the environment (54% undecided or disagree). Why teachers are less confident about student knowledge is not known, but it could be an indication of the

dichotomy of increased curriculum integration of the environment into content areas but low level of importance placed on teaching science and social studies in the classrooms.

Table 10

*Responses to Confidence Questions*

<b>Indicate your confidence in incorporating or teaching environmental issues to your students</b>	<b>Strongly Agree</b>	<b>Agree</b>	<b>Undecided</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
I can easily answer student questions about the environment (n=638) (missing n=0)	16% (n=102)	64% (n=406)	14% (n=92)	6% (n=37)	0.2% (n=1)
The environment does not apply to the content area (s) I teach (n=638) (missing n=1)	1% (n=8)	6% (n=36)	7% (n=47)	56% (n=357)	30% (n=189)
I feel that teaching about the environment wastes time in the classroom (n=638) (missing n=3)	0.5% (n=3)	1% (n=9)	3% (n=18)	41% (n=260)	54% (n=345)
I do not know anything about local environmental issues or problems (n=638) (missing n=1)	0.3% (n=2)	6% (n=38)	11% (n=70)	55% (n=352)	27% (n=175)
My students know a lot about the environment (n=638) (missing n=6)	4% (n=25)	42% (n=268)	30% (n=187)	21% (n=133)	3% (n=19)
I know many resources I can utilize to help me teach about the environment (n=638) (missing n=1)	8% (n=51)	39% (n=246)	19% (n=121)	30% (n=193)	4% (n=26)
I feel my students learn better when using the environment as a context for teaching content (n=638) (missing n=5)	11% (n=67)	53% (n=337)	33% (n=208)	4% (n=25)	0.2% (n=1)

**Environmental Knowledge Test**

Environmental knowledge of the teachers was assessed by having them take an environmental knowledge test composed of 12 questions. Using the grading scale set up by NEETF and Roper (2001), grade categories were calculated based on the percentage of correct answers. Teacher environmental knowledge was considered acceptable if they had 8 or more correct answers out of 12; those scoring 7 or less on the test were considered to have an unacceptable level of environmental knowledge (Table 11).

The teachers in this district have high environmental knowledge as reflected on the Environmental Knowledge test, especially compared with the general public results from 2001 NEETF Roper report (2001). Of the elementary teacher respondents, 73.5%

received an acceptable score and 26.5% received an unacceptable score, the overall average score on the test was 9.4. As a comparison, NEETF and Roper (2001) reported a discouraging low 32% acceptable grade on their survey of American adults. Explanation for this high knowledge could lie in the increased attention the environment has received in the last 15 years and the cultural shift that has been occurring that has placed the environment in our consciousness and everyday lives, for example, recycling has become a norm in regard to waste disposal, energy use and economic incentives are available to reduce carbon emissions.

Table 11

*Acceptability of Scores on Knowledge Test*

Grade	Score	Percent of respondents per score	Acceptable/ Unacceptable
A	11 or 12	33.7%	Acceptable
B	10	22.4%	Acceptable
C	9	17.4%	Acceptable
D	8	11.3%	Unacceptable
F	7 or fewer	15.2%	Unacceptable

To look at the performance on the test a little more closely, each question was analyzed to identify what questions the teachers may have struggled with. Table 12 outlines the percentage of correct answers for each question and the comparison with the NEETF Roper, 2001 study. The topics that teachers struggled, receiving an average unacceptable score, included questions with topics on the sources of air pollution, energy sources, ozone, and nuclear waste. Given the popular information regarding the Chesapeake Bay and the causes of its health decline in our region it was surprising to see a barely acceptable score in the questions on runoff and on the Chesapeake Bay. These specific responses to the questions indicated the lack of general understanding regarding important topics and local environmental problems. Though this is a narrow snapshot of



teacher knowledge, it reflects the continual need to increase teacher overall environmental knowledge and expose teachers through professional development to these topics.

Table 12

*Environmental Knowledge Test Correct Responses*

<b>Environmental Knowledge Test</b>	<b>District Elementary Teachers</b>	<b>NEETF/Roper Survey, 2001</b>
Definition of biodiversity	94%	41%
The largest source of carbon monoxide (air pollution) in United States	67%	65%
How most electricity in the United States is generated	59%	33%
The most common source of water pollution	76%	28%
Recognition of a renewable resource	84%	65%
Protection provided by ozone in Upper Atmosphere	68%	54%
Where most household garbage ends up	88%	85%
Knowledge about materials considered hazardous waste	92%	67%
The most common reason for extinction of animal and plant species	89%	74%
Disposal of nuclear waste in the United States	65%	57%
The primary benefit of wetlands	86%	53%
Largest environmental problem effecting Chesapeake Bay	73%	--

**Effect of Training and Experience on Confidence Measures**

**Teaching Experience**

A Oneway Analysis of Variance (ANOVA) was conducted to analyze if the number of years of teaching experience influenced any of the environmental scales/categories: Awareness, Teach About Environment, Teach Outdoors, Confidence, Environmental Knowledge Test, and Training Hours. Three categories for years teaching were created based on relatively even groups: 1-9 years (n=229), 10-19 years (n=242), and 20+ years (n=167). The analysis shows that with the exception of training hours, all of the categories were significant. Examination of the means helps to provide interpretation of the possible reasons for the significance (Table 13). Those teachers that

had more teaching experience had a higher positive response on all of the environmental scales as compared to those teachers that had less teaching experience. It would be logical that seasoned teachers would feel much more comfortable and be more confident in all aspects of teaching including environmental topics and outdoor methodology. More experience did not translate to having more training.

Table 13

*Analysis of Variance Years Teaching and Scores (n=638)*

<b>Environmental Literacy Scales</b>	<b>1-9 Years Teaching</b>		<b>10-19 Years Teaching</b>		<b>20+ Years Teaching</b>		<b>F-ratio</b>
	M	SD	M	SD	M	SD	
Awareness (10-40)	21.75	5.10	23.70	4.96	24.24	5.37	13.69***
Teach Environment (10-30)	28.16	6.55	28.61	5.94	29.72	6.58	3.01*
Teach Outdoors (10-60)	38.56	5.23	38.86	5.50	40.09	5.19	4.18*
Confidence (10-70)	36.81	5.40	38.02	5.15	39.43	5.21	11.94***
Environmental Knowledge Test (1-12)	8.92	2.28	9.59	1.88	9.78	1.87	10.40***
Environmental Training (Hours)	54.81	91.84	59.70	119.44	75.73	109.64	1.34

*Note: \*p < .05, \*\*p < .01, \*\*\*p < .001*

### **Professional Development Experience**

A Oneway Analysis of Variance (ANOVA) was conducted to determine if the hours teachers reported attending environmental literacy training were significant with regard to the mean scores on the Awareness Scale, Teach Environment Scale, Teach Outdoors Scale, Confidence Scale, and the Environmental Knowledge Test (Table 14). The differences between the means by the amount of training categories were all significant at the 99% confidence level. Teachers that have received more training in environmental literacy are significantly more aware and more confident with teaching environmental concepts, teaching outdoors, and scored higher on the Environmental

Knowledge test than those that received less training. This is significant in that it outlines the need to provide training in order to increase the confidence and knowledge needed to increase teacher capacity to teach their students to become environmentally literate.

Table 14

*Analysis of Variance Environmental Training and Scores (n=431)*

<b>Environmental Literacy Scales</b>	<b>1-6 Hours of Training</b>		<b>7-52 Hours of Training</b>		<b>52+ Hours of Training</b>		<b>F-ratio</b>
	M	SD	M	SD	M	SD	
Awareness (10-40)	23.17	.37	24.09	.40	26.25	.30	20.89***
Teach Environment (10-30)	28.82	5.71	29.47	5.52	31.30	5.82	7.62***
Teach Outdoors (10-60)	39.36	5.20	39.17	5.09	39.88	4.95	6.16**
Confidence (10-70)	37.14	4.77	37.99	4.70	41.21	4.85	30.17***
Environmental Knowledge Test (1-12)	9.17	2.21	9.45	2.04	10.12	1.67	9.10***

*Note: \*p < .05, \*\*p < .01, \*\*\*p < .001*

### **Intensive Professional Development Experience**

To try to gain a and better understanding of the effect of the professional development on teacher awareness and confidence, alternative categories were created to examine if specific environmental literacy training had any significant relationships. The 3 categories created were: 1) intensive environmental literacy professional development; 2) multiple environmental training; and 3) no environmental training. The first group included all those who had taken more than 6 hours of district environmental literacy training as well as those who had taken one or more MSDE continuous education courses. The logic for this grouping was that if the respondent indicated an MSDE course, it most likely was a focused environmental education course, whereas if it were a college course, it most likely was a course that was not specific to environmental or outdoor teaching, for example Ecology or Biology, and was not focused on teaching the

environmental concepts. Nationwide as well as here in Maryland, there are very few college courses available that are solely focused on environmental education, and as noted above there is no pre-service teacher requirement in environmental literacy in Maryland. The second group included all others that had taken some environmental training, and the third group was comprised of those that did not respond or did not indicate any training.

The differences in the means were very significant at the  $p < .001$  level (Table 15). There was a strong difference in the means between the three categories with those that received intensive training having the highest mean in all categories. This result has implications for the importance of focused environmental literacy training for teachers and the need for this type of professional development to build confidence in teaching and awareness as well as knowledge in this area.

Table 15

*Analysis of Variance Special Training and Scales (n=638)*

<b>Environmental Literacy Scales</b>	<b>Intensive Env. Literacy Training (n=200)</b>		<b>Any Env. Literacy Training (n=231)</b>		<b>No Env. Literacy Training (n=207)</b>		<b>F-ratio</b>
	M	SD	M	SD	M	SD	
Awareness (10-40)	26.05	3.73	23.25	4.56	20.13	5.51	81.47***
Teach Environment (10-30)	30.88	5.53	29.06	5.87	26.30	6.81	29.25***
Teach Outdoors (10-60)	40.33	4.78	39.49	5.08	37.39	5.77	17.25***
Confidence (10-70)	40.24	4.77	37.65	5.06	37.96	5.40	34.65***
Environmental Knowledge Test (1-12)	9.93	1.75	9.31	2.18	8.99	2.10	11.51***
Environmental Training (Hours)	95.27	118.83	35.06	5.93	0	-	35.63***

Note: \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

## Experience Through Direct Programming

As part of kindergarten and fourth grade, every student participates in an outdoor environmental literacy experience conducted by the District Environmental Literacy and Outdoor Education Office. Students spend a day to a day and a half learning environmental topics outdoors. Teachers are also engaged in the experience through teaching and observation. One of the questions explored whether these teachers had more confidence because of their participation in and exposure to an outdoor environmental literacy experience. A t-test was utilized to look at their scores vs. non participant in outdoor programming scores (Table 16).

Table 16

*Summary of t-Tests for Environmental Literacy Scales for Program Experience and No Program*

Environmental Literacy Scales	K/4 Teachers Program (n=171)		1,2,3,5 Teachers No Program (n=264)		t-ratio
	M	SD	M	SD	
Awareness Scale (10-40)	24.88	4.23	23.14	5.14	3.68***
Teach Environment Scale (10-30)	29.84	6.20	29.50	5.93	.578
Teach Outdoors Scale (10-60)	40.06	4.84	39.01	5.45	2.04*
Confidence Scale (10-70)	38.46	5.18	38.31	5.54	.287
Environmental Knowledge Test (1-12)	9.32	2.04	9.47	2.15	-.716
Training (hours)	54.09	85.89	68.08	115.80	-1.17

Note: \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

The kindergarten and fourth grade teachers had significantly higher scores on the Awareness and Teach Outdoors Scales, and they also reported a higher number of hours trained in the district environmental literacy professional development. Direct exposure and experience to the outdoor programming, greater professional development opportunities, and possible heightened interest to attend these types of professional development, are all probable influences on their outdoor teaching confidence. This

points to the need to craft professional development in a way that provides that direct exposure to outdoor programming so that teachers can build that confidence through exposure and experience.

### **Summary of Results**

In a district with imbedded environmental literacy curriculum units for all elementary grade levels as well as mandatory outdoor programming at two of the elementary grade levels, it is not surprising that teachers are well aware of, and knowledgeable about, environmental issues and that they are confident in teaching about and in the environment. Analysis of the effect of experience and training indicated very significant influence on the awareness teachers have about curriculum and policy, their participation in teaching about the environment, their ability to use the outdoors for instruction, and their overall general confidence in regard to environmental issues and teaching. The more specialized the professional development obtained, the more confident teachers are in teaching about the environment and teaching in the environment. Exposure to direct programming and training can also contribute to higher confidence levels.

### **Conclusions**

This study was conducted in response to the need to understand teacher capacity to implement the integration of state environmental literacy standards into curriculum and meet the high school graduation requirement in environmental literacy. With the full understanding that in order to nurture environmental literacy in our students, we must recognize the important role teachers play in meeting this goal, and in turn, we must recognize the need for those teachers to be environmentally literate as well. Given that

currently there is no requirement in this state for teacher preservice training in environmental literacy, that teacher in-service training is district based, and that there are no studies of the effectiveness of a mandated environmental literacy curriculum, this study helps to explore whether teachers have the confidence and knowledge to meet this requirement. By examining the factors that influence teacher confidence and knowledge, we can begin to develop strategies for the design of professional development programs that can advance the state goal of environmental literacy.

It should be noted that this district has had a robust environmental education program in place for fifty years that includes programming, professional development and outreach. This influence may well have positively affected the results of the study. The importance of this study is that Maryland district content coordinators and others in school districts across the states can reference this study as they go about implementing similar environmental literacy mandates and can use it as a guide for building their own professional development for their in-service and preservice teachers. It is hoped that in the future there will be a wealth of professional development programs across the state as well as follow up studies and learning assessments that can be cross referenced by school districts as they continue to develop and refine their strategies and efforts to produce generations of environmentally literate citizens.

Overall, the elementary teachers in this school district have a high awareness and confidence regarding teaching in and about the environment. They are also highly knowledgeable about environmental topics. These elementary teachers demonstrated that the more focused training and experience a teacher has, the more confident they are in environmental and outdoor teaching. Some of these outcomes are attributed to training

but there are many other elements that can influence confidence that were not measured. Personal beliefs and attitudes towards the environment and life experiences are all factors that may influence teacher confidence, desire and ability to incorporate environmental concepts and use the environment as a classroom (Tuncer, et. al., [2009](#), Kahyaoglu, [2014](#), Atasoy, [2005](#), Shuman & Ham, 1997, and Kennelly, Taylor & Maxwell, [2008](#)).

The results of this study auger well for the future of environmental literacy instruction in the school district. While the generally positive outcomes of the study may be attributed to the overall general cultural shift regarding the importance of the environment in general, I believe that they are also due to the positive emphasis on the environment in the district through the curriculum, its culture, the professional development offerings and the emphasis on green school certification.

By exposing our teachers directly to learning and teaching in the environment, teachers gain confidence in teaching outdoors. This emphasizes the need to incorporate direct experiences and practice when shaping environmental literacy professional development for teachers. Fortunately, the district is well positioned to advance this agenda through its history of environmental and outdoor education programs, and through the establishment of an environmental literacy office that oversees the implementation of the state requirement for student environmental literacy.

Notwithstanding the overall confidence of teachers in teaching in and about the environment, it is still important to recognize that only 56% of the teachers indicated they took students outside for instruction. Many of the challenges that the teachers noted were similar to those reported in other studies and included safety, time, resources, appropriate spaces, permission, appropriateness, and student management (Rickinson, et. al., [2004](#)).



Overcoming some of these challenges does not lie solely with the teacher and their confidence but also will involve administration, facilities, and content curriculum developers. Focused professional development on the pedagogy and management strategies for instruction in the outdoors is needed not only for teachers but also administrators. The development and acceptance of our school grounds as its own classroom needs to be pursued as a cultural and systemic shift in our understanding of the modern classroom. The integration of environmental topics and outdoor instruction into content areas beyond science will build both the understanding and capacity of teachers for the benefit of student engagement and experience, and will broaden the understanding of teachers, students, and administrators that environmental literacy is an interdisciplinary and multidisciplinary enterprise.

### **Impact for the School District**

This current research clearly indicates the positive benefits resulting from the district environmental literacy professional development. The importance of professional development for teacher confidence in utilizing the outdoor and the environment as a teaching tool should help to encourage more use of the environment as a strategy for teaching. Emphasis on focused, experiential, high quality professional development will help build the capacity and confidence of teachers.

Though teachers scored high on the environmental knowledge test, it should be emphasized that the District should continue to build capacity in this area so that teachers will feel more comfortable with environmental issues and content. Moreover, we need to keep in mind that the environment, and environmental issues, are not static realities, and that teachers will need access to continuing education in these areas.

Providing targeted professional development for administrators to engage them in the knowledge that using the outdoors and the environment can improve test scores, engage students, and foster relevant learning will help to provide the support needed for teachers to engage in this type of teaching. It would be important to also conduct an examination of how school facilities can be improved for the use of the outdoors as a classroom and facilitate changes to help remove some of the barriers teachers expressed.

### **Suggestions for Future Research**

In consideration of replication of this study, a couple of suggestions would help to increase the validity of the study. Surveying a stratified random sample of the teachers instead of the entire population would decrease the voluntary response bias and increase the validity of the analysis by focusing on a stronger return rate. A review of the grouped sets of questions should be analyzed and modified to increase the Cronbach's Alpha for a stronger internal reliability. Further, follow up the survey with interviews to create a mixed methods approach would help to understand the types of professional development and reasoning behind some of the confidence measures.

Based on the results of this study, the following recommendations are suggested for future research to continue to contribute to the body of knowledge regarding environmental education and literacy:

1. A similar study to examine if the other factors that were not measured as part of this study, personal beliefs and attitudes towards the environment and life experiences in the environment, influence teacher confidence in teaching about or in the environment.

2. A robust examination to identify what specific aspects of teacher professional development programs have the most benefit in building teacher confidence in environmental literacy.
3. A similar study of middle and high school teachers to examine if their confidence, training and experience are similar to those of elementary teachers, with a particular focus on secondary teachers who are more content specific in their instruction.
4. A study to examine the development of assessment tools to determine if teacher confidence translates into student learning outcomes.
5. The development of effective ways of assessing student environmental literacy and investigating how their outcomes are influenced by teacher education and experience.
6. The development of a recommendations for professional development needs and strategies for pre-service training for teachers based on the what has been learned regarding professional development of in-service teachers.

## Appendices & Bibliography

### Appendix A: IRB Approval



1204 Marie Mount Hall  
College Park, MD 20742-5125  
TEL 301.405.4212  
FAX 301.314.1475  
irb@umd.edu  
www.umresearch.umd.edu/IRB

DATE: February 9, 2017

TO: Melanie Parker, EdD  
FROM: University of Maryland College Park (UMCP) IRB

PROJECT TITLE: [987426-1] Teaching for a Sustainable Future: Teacher Capacity to Implement Environmental Literacy Requirements

REFERENCE #:  
SUBMISSION TYPE: New Project

ACTION: APPROVED  
APPROVAL DATE: February 9, 2017  
EXPIRATION DATE: February 8, 2018  
REVIEW TYPE: Expedited Review

REVIEW CATEGORY: Expedited review category # 7

Thank you for your submission of New Project materials for this project. The University of Maryland College Park (UMCP) IRB has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a project design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

Prior to submission to the IRB Office, this project received scientific review from the departmental IRB Liaison.

This submission has received Expedited Review based on the applicable federal regulations.

This project has been determined to be a Minimal Risk project. Based on the risks, this project requires continuing review by this committee on an annual basis. Please use the appropriate forms for this procedure. Your documentation for continuing review must be received with sufficient time for review and continued approval before the expiration date of February 8, 2018.

Please remember that informed consent is a process beginning with a description of the project and insurance of participant understanding followed by a signed consent form. Informed consent must continue throughout the project via a dialogue between the researcher and research participant. Unless a consent waiver or alteration has been approved, Federal regulations require that each participant receives a copy of the consent document.

Please note that any revision to previously approved materials must be approved by this committee prior to initiation. Please use the appropriate revision forms for this procedure.

All UNANTICIPATED PROBLEMS involving risks to subjects or others (UPIRSOs) and SERIOUS and UNEXPECTED adverse events must be reported promptly to this office. Please use the appropriate reporting forms for this procedure. All FDA and sponsor reporting requirements should also be followed.

All NON-COMPLIANCE issues or COMPLAINTS regarding this project must be reported promptly to this office.

Please note that all research records must be retained for a minimum of seven years after the completion of the project.

If you have any questions, please contact the IRB Office at 301-405-4212 or irb@umd.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within University of Maryland College Park (UMCP) IRB's records.

## Appendix B: School District Research Approval



ANNE ARUNDEL  
COUNTY PUBLIC SCHOOLS

2644 Riva Road, Annapolis, MD 21401 | 410-222-5000 · 301-970-8644 (WASH) · 410-222-5500 (TDD) | [www.aacps.org](http://www.aacps.org)

February 28, 2017

Ms. Melanie Parker  
[mdparker@aacps.org](mailto:mdparker@aacps.org)  
410-222-3822

Re: Research Application

Dear Ms. Parker:

Thank you for your interest in conducting the study Teaching for a Sustainable Future: Teacher Capacity to Implement Environmental Literacy Requirements in Anne Arundel County Public Schools. We have had an opportunity to review your request.

All requests to conduct research in Anne Arundel County Public Schools are reviewed in regard to three major criteria. First, does the research have a potential positive contribution towards improving the delivery of instruction to students attending Anne Arundel County Public Schools? Second, does the research have procedures and processes in place to insure the confidentiality of all participants in the study? Third, does the research obtain its data in such a way that it will have a minimal impact upon the instructional time of students and/or staff?

The proposed study will address important areas of education research and at this time we are approving your application to conduct research in Anne Arundel County Public Schools for the schools referenced in the accompanying application. I have also reviewed the study for the purpose of determining how well it ensures the confidentiality of all respondents. There is nothing that would suggest that personal identifying information will be divulged outside of the research team. Please note that principals/teachers should only be contacted one time and "no response" should be considered the same as if they declined participation. In closing, I would like to ask that you consider this letter as formal approval of your request to conduct your research project in Anne Arundel County Public Schools. Please insure that all school, teacher or student identifying information is removed from any prepared documents, either paper or electronic, that may be a part of any final drafts of documents relating to your study.

On behalf of the Research Office, I wish you success in the conduct of your study.

Sincerely,

A handwritten signature in black ink, appearing to read "Chris Grandieri", is written over a light blue rectangular background.

Christopher M. Grandieri  
Senior Manager of Research  
Instructional Data Division

cc: Mr. Jason A. Dykstra

## Appendix C: Survey Instrument

### AACPS Teacher Environmental Literacy

#### Consent

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#### ***Consent To Participate***

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##### Project Title

***Teaching for a Sustainable Future: Teacher Capacity to Implement Environmental Literacy Requirements***

##### Purpose of the Study

*This research is being conducted by Melanie Parker, AACPS Coordinator of Environmental Literacy and Outdoor Education, doctoral candidate at the University of Maryland, College Park. The purpose of this study is to investigate elementary teacher's reported confidence in their ability to teach environmental literacy standards and curriculum. Studies have shown that teachers' personal environmental literacy, along with their experiences, attitudes and training in regards to the environment influence their confidence. The focus of this study will be on the teachers' personal environmental literacy and their training and experience in teaching about and in the environment and its influence on their confidence in their ability to teach in this area. By understanding where the teachers are with these concepts, professional development for teachers can be focused to help provide needed environmental literacy instruction.*

##### Procedures

*The procedures involve participating in an online anonymous survey that will take approximately 10 minutes to complete. The questions will be asking about experiences and knowledge regarding the environment and environmental literacy. There are 5 sections: consent to participate form, demographic information, training in environmental and outdoor education, teachers' perceived self-confidence in teaching in the outdoors or the environment, and a multiple choice section that evaluates their personal environmental literacy.*

##### Potential Risks and Discomforts

*No known risks have been identified for this study.*

##### Potential Benefits

*There are no direct benefits for participation. You may, however, gain knowledge about environmental issues through the process of completing the survey. There are potential benefits to the district as information from the study will inform professional development needs in environmental literacy for the district.*

##### Confidentiality

*The survey is anonymous. When you enter the survey you will be assigned a unique number and your responses will be reported with that ID. There is no way to link your responses to your name. There are no questions that will disclose your identity. All responses will be reported in the aggregate. The data from the survey will be maintained on the primary researcher's password protected computer and will not be shared with others. Only the researcher will have access to the data and aggregate data will be utilized for analysis.*

#### **Right to Withdraw and Questions**

*Your participation in this research is completely voluntary. You may choose not to take part at all. If you decide to participate in this research, you may stop participating at any time. **Employment with the district will not be affected by your participation or non-participation in this study.***

*If you have questions, concerns, or complaints, related to the research, please contact the investigator: Melanie Parker, [mdparker@aacps.org](mailto:mdparker@aacps.org), 410-222-3822.*

#### **Participant Rights**

*If you have questions about your rights as a research participant or wish to report a research-related injury, please contact:*

University of Maryland College Park  
Institutional Review Board Office  
1204 Marie Mount Hall  
College Park, Maryland, 20742  
E-mail: [irb@umd.edu](mailto:irb@umd.edu)  
Telephone: 301-405-0678

*This research has been reviewed according to the University of Maryland, College Park IRB procedures for research involving human subjects.*

#### **Statement of Consent**

***By selecting "yes" below you are agreeing*** that you are at least 18 years of age; you have read this consent form; your questions have been answered to your satisfaction and you voluntarily agree to participate in this research study. Please print a copy of the consent page for your records.

---

☐ Yes

☐ No



Dear Teacher,

Thank you for taking the time to participate in this survey. This survey will be helping us determine the professional development needs in Anne Arundel County regarding environmental literacy. Because environmental literacy is interdisciplinary, you were selected in order to provide a sample of teachers from all disciplines and elementary grade levels. This survey will take about 10 minutes to complete and is completely anonymous.

This survey is being conducted as part of the AACPS Environmental Literacy and Outdoor Education Office's need to have a better understanding of the capacity and ability of teachers to teach environmental literacy concepts and to formulate professional development needs based on this information. The questions will be asking about your experiences and knowledge regarding the environment and environmental literacy. Information from this survey is serving as a basis of a dissertation for Melanie Parker, Coordinator of Environmental Literacy and Outdoor Education, AACPS through University of Maryland Graduate School.

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#### Demographic Information

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What grade level do you primarily teach?

---

- |  |                                  |
|--|----------------------------------|
| <input type="radio"/> Pre-Kindergarten | <input type="radio"/> 3rd Grade  |
| <input type="radio"/> Kindergarten     | <input type="radio"/> 4th Grade  |
| <input type="radio"/> 1st Grade        | <input type="radio"/> 5th Grade  |
| <input type="radio"/> 2nd Grade        | <input type="radio"/> All Grades |



Select the disciplines that you currently teach (you may select more than one)

---

☐ All Core Disciplines

☐ Math

☐ Science

☐ Social Studies

☐ Language Arts

☐ Foreign Languages

☐ Art

☐ Music

☐ Physical Education

☐ English Language Learners

☐ Special Education

☐ Technology

☐ Business

☐ Health

☐ Other

How many years have you been teaching including the current year?

---

Professional Development

---

Have you participated in any professional development related to teaching environmental topics or teaching outdoors?

---

Enter number courses of professional development for each category.

AACPS Environmental Literacy (i.e. Arlington Echo) Inservice

AACPS Curriculum Inservice that included environmental literacy as a component.

College Courses with environmental/outdoor focus

MSDE Credit Course - AACPS or Other sponsor with environmental/outdoor focus

Other Workshop - non credit (Project Learning Tree, Chesapeake Bay Foundation, nonprofit, DNR, etc.)

Enter number courses of professional development  
for each category.

Other Environmental Professional  
development (i.e. conference, online)

**Rank the effectiveness of the type of professional development, 1 being the most  
effective and 6 being the least effective.**

---

- ☐ AACPS Environmental Literacy (i.e. Arlington Echo) Inservice
- ☐ AACPS Curriculum Inservice that included environmental literacy as a component.
- ☐ College Courses with environmental/outdoor focus
- ☐ MSDE Credit Course - AACPS or Other sponsor with environmental/outdoor focus
- ☐ Other Workshop - non credit (Project Learning Tree, Chesapeake Bay Foundation,  
nonprofit, DNR,etc.)
- ☐ Other Environmental Professional development (i.e. conference, online)

**Comments:**

---

**Are you aware that...**

---

	Very Aware	Had heard about it	Did not know
There are Maryland Environmental Literacy Standards	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Maryland has a high school graduation requirement in environmental literacy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Very Aware	Had heard about it	Did not know
AACPS has embedded environmental literacy focused units/activities in the curriculum at each grade	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Kindergarten and Fourth Grade attend environmental literacy field experiences at Camp Woodlands and Arlington Echo	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Teaching

### When you teach, how often do you

	Often	Sometimes	Rarely	Never
Take students outside as part of instruction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Teach your students about environmental issues such as pollution, climate, habitat loss, Chesapeake Bay	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Use the environment/nature as a theme? for example: writing poetry about the weather, drawing animals, measuring trees	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please indicate your agreement with the following statements about taking students outdoors for instruction:

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
I feel comfortable taking students outside for instruction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Managing students outside is very hard	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I know my school's outdoor property	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The administrator does not want us to take students outside for instruction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Unpredictable things that happen outside are opportunities for students to learn	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel my students learn better when using the outdoors to teach.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Comments:**

**Indicate your confidence in incorporating or teaching environmental issues to your students.**

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
I can easily answer student questions about the environment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The environment does not apply to the content area (s) I teach	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel that teaching about the environment wastes time in the classroom	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I do not know anything about local environmental issues or problems	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
My students know a lot about the environment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I know many resources I can utilize to help me teach about the environment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel my students learn better when using the environment as a context for teaching content.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Comments:

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### Environmental Literacy

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Your Environmental Literacy - The following questions evaluate your understanding of environmental concepts and issues. At the end of the survey you will receive your score!

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There are many different kinds of animals and plants, and they live in many different types of environments. What is the word used to describe this idea?

---

- ☐ Multiplicity
- ☐ Biodiversity
- ☐ Socio-economics
- ☐ Evolution
- ☐ Don't Know

Carbon monoxide is a major contributor to air pollution in the U.S. Which of the following is the biggest source of carbon monoxide?

---

- ☐ Factories and businesses
- ☐ People breathing

- ☐ Motor vehicles
- ☐ Trees
- ☐ Don't Know

**How is most electricity in the U.S. generated?**

---

- ☐ By burning oil, coal and wood
- ☐ With nuclear power
- ☐ Through solar energy
- ☐ By hydro electric power plants
- ☐ Don't know

**What is the most common cause of pollution of streams, rivers and oceans?**

---

- ☐ Dumping of garbage by cities
- ☐ Surface water running off yards, city streets, paved lots and farm fields.
- ☐ Trash washed into the ocean from beaches
- ☐ Waste dumped by factories
- ☐ Don't know

**Which of the following is a renewable resource?**

---

- ☐ Oil
- ☐ Iron Ore
- ☐ Trees
- ☐ Coal
- ☐ Don't know

**Ozone forms a protective layer in the earth's upper atmosphere. What does ozone protect us from?**

---

- ☐ Acid rain

- ☐ Global warming
- ☐ Sudden changes in temperature
- ☐ Harmful, cancer-causing sunlight
- ☐ Don't know

**Where does most of the garbage in the U.S. end up?**

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- ☐ Oceans
- ☐ Incinerators
- ☐ Recycling centers
- ☐ Landfills
- ☐ Don't know

**Which of the following household wastes is considered a hazardous waste?**

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- ☐ Plastic packaging
- ☐ Glass
- ☐ Batteries
- ☐ Spoiled food
- ☐ Don't know

**What is the most common reason that an animal species becomes extinct?**

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- ☐ Pesticides are killing them
- ☐ Their habitats are being destroyed by humans
- ☐ There is too much hunting
- ☐ There are climate changes that affect them
- ☐ Don't know

**Scientists have not determined the best solution for disposing of nuclear waste. In the U.S. what do we do with it now?**

---

- ☐ Use it as nuclear fuel
- ☐ Sell it to other countries
- ☐ Dump it in landfills
- ☐ Store and monitor the waste
- ☐ Don't know

**What is the primary benefit of wetlands? Do they...**

---

- ☐ Promote flooding
- ☐ Help clean the water before it enters lakes, streams, river or bay
- ☐ Help keep the number of undesirable plants and animals low
- ☐ Provide a good site for landfills
- ☐ Don't know

**The largest environmental problem affecting the Chesapeake Bay is**

---

- ☐ Dredging for sand
- ☐ Litter making it way into the Bay
- ☐ Gas-powered boats
- ☐ Application of fertilizer on lawns and farms
- ☐ Don't know

**Additional Prompt**

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**Thank you for taking the time for this survey, we appreciate your willingness to share your thoughts and information for this study.**



## **Appendix D: Emails to Participants**

Dear Anne Arundel Elementary Teacher,

I am inviting you to participate in an online survey that is being conducted as part of a research study entitled, “*Teaching for a Sustainable Future*”. This study is being conducted as part of my doctoral program at the University of Maryland, College Park and I am conducting this research as part of my dissertation. The purpose of the study is to obtain elementary teachers’ perceptions about how confident they are in teaching environmental literacy concepts. The questions will ask about your experience, training, confidence and knowledge regarding the environment and environmental literacy.

The survey will take about 10 minutes to complete and is completely anonymous. The results will be used by the AACPS Environmental Literacy and Outdoor Education Office to inform the design of future professional development and other resources to help teachers provide instruction in environmental literacy.

If you are willing to participate, please click on the link below to be directed to the survey.

If you have any questions about this survey, contact me, Melanie Parker, at [mdparker@aacps.org](mailto:mdparker@aacps.org) or the co-advisors of this study at the University of Maryland, Dr. John Norris at 615.585.8379 and Dr. Margaret J. McLaughlin, [mjm@umd.edu](mailto:mjm@umd.edu).

I appreciate your participation in this study! I will be sending reminder emails over the next two weeks to encourage your participation.

**[Click Here to Participate in this Study](#)**

Melanie Parker  
Coordinator of Environmental Literacy and Outdoor Education  
Anne Arundel County Public Schools  
UMD EdD Candidate

### **Second and Third Email Reminder**

Dear Anne Arundel Elementary Teacher,

This email is to follow up on the request to participate in the study, “*Teaching for a Sustainable Future*”. This is an anonymous online survey that should take you no more than 10 minutes to complete.

**If you have completed the survey – *Thank you very much* and please disregard this email.**

If you have not, please help us understand the capacity and ability of teachers to teach environmental literacy concepts. The questions will be asking about your experience, training, confidence and knowledge regarding the environment and environmental literacy.

I appreciate your participation in this study!

**[Click Here to Participate in this Study](#)**

Melanie Parker  
Coordinator of Environmental Literacy and Outdoor Education  
Anne Arundel County Public Schools  
UMD EdD Candidate

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